INTEGRATED FUELL CELL HYBRID POWER PLANT WITH CONTROLLED OXIDANT FLOW FOR COMBUSTION OF SPENT FUEL

ABSTRACT OF DISCLOSURE

[0043] A hybrid power generation system for generating electrical power comprises a compressor for producing a compressed oxidant and a recuperator in flow communication with the compressor. The hybrid power generation system further comprises a fuel cell assembly comprising a plurality of fuel cells in flow communication with the recuperator to provide the compressed oxidant for the fuel cell assembly. The fuel cell assembly further comprises a cathode inlet for receiving the compressed oxidant, an anode inlet for receiving a fuel stream, an anode outlet in flow communication with an anode exhaust stream and a cathode outlet in flow communication with a cathode exhaust stream, wherein at least a portion of the fuel reacts with the oxidant to produce electrical power. The hybrid power generation system further comprises a tail gas burner in flow communication with the anode outlet and the cathode outlet. The tail gas burner is configured for combusting a mixture of at least a portion of the anode exhaust stream and at least a portion of the cathode exhaust stream and producing a hot compressed gas. A control system is used for controlling the amount of the cathode exhaust stream introduced in the tail gas burner for stable combustion and reduction of fuel and carbon monoxide emission. The hot compressed gas from the tail gas burner is introduced to a turbine, where the hot compressed gas is expanded, thereby producing electrical power and an expanded gas.